

2. GEOGRAPHY AND ECOLOGY OF FARQUHAR ATOLL

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Introduction

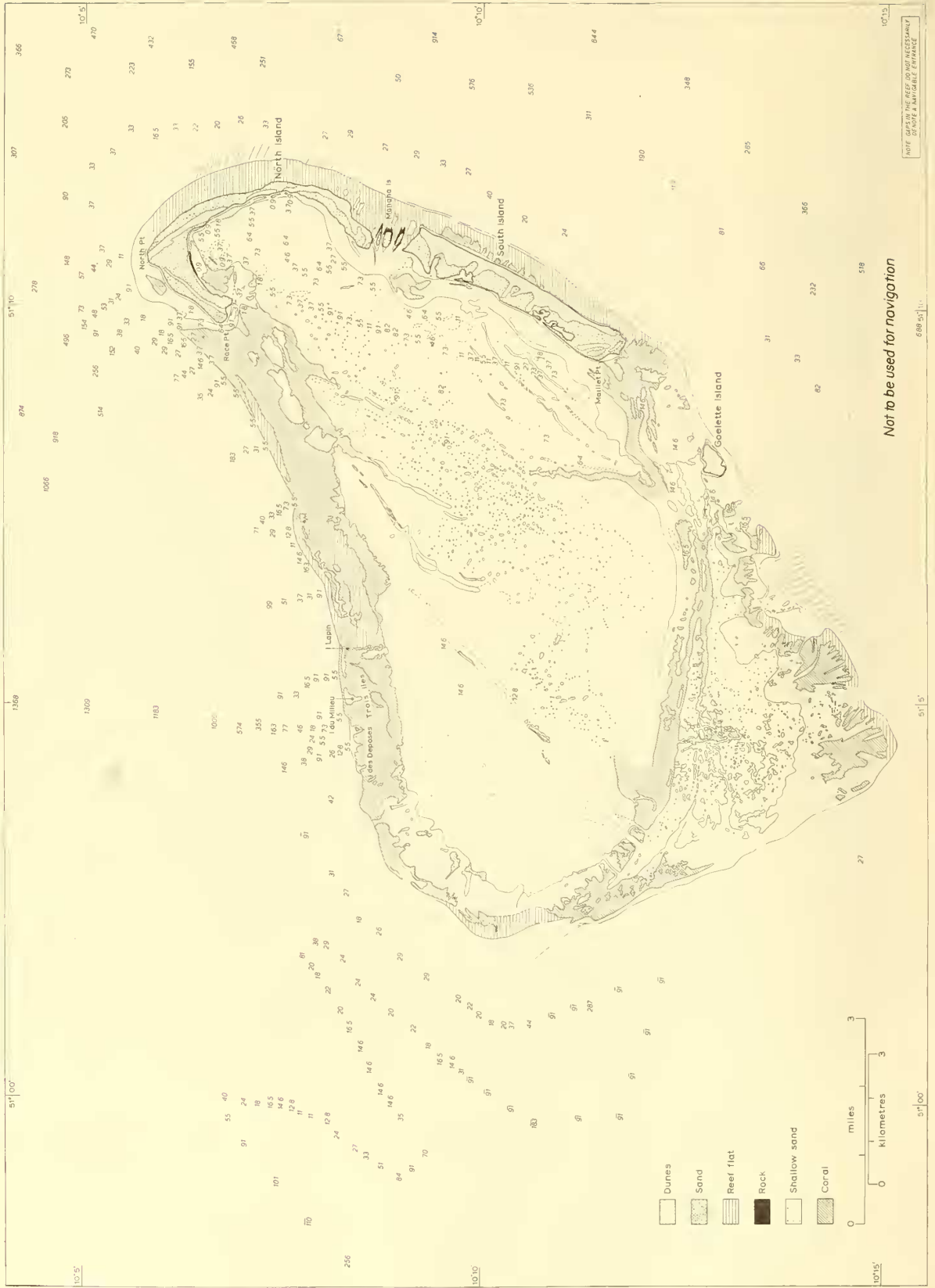
Farquhar Atoll (10°11'S, 51°07'E) lies 285 km northeast of Madagascar and 1150 km from the coastline of Africa. It is roughly triangular in shape, with an area of 170 sq km. Apart from small sand cays on the northern rim (Iles des Déposés, du Milieu, Lapin) dry land is confined to the eastern or windward side. Total land area, by planimetry from Figure 2, is 7.5 sq km or 4.4 per cent of the area of the atoll.

The first chart of Farquhar was made by Margaro in 1776 and published, with additions by W. F. W. Owen in 1824, as Admiralty Chart 718 in 1878. This chart is very rudimentary. The atoll was surveyed by Cdr W. J. L. Wharton in 1878, with a large-scale survey of the lagoon entrance by Lt. J. T. A. White, and these surveys formed the basis of a revision of Chart 718 in 1879. Wharton's survey, with some recent additions, is the basis of present charts; it is detailed only for the northern rim and the eastern islands. Figure 2 is based on air photograph cover of the atoll flown in 1960, with topographic control and bathymetry from the Admiralty chart: while reef features are shown in detail, this map should not be used for navigational purposes.

The first biological observations on record are those of Fairfax Moresby in 1822, but these remained unpublished. The Percy Sladen Expedition spent three days on Farquhar in 1905, when Stanley Gardiner worked over North Island, especially the seaward reef, and the entomologist Bainbrigge Fletcher, over South Island. The collections made were small and heterogeneous; determinations published for various groups in the Percy Sladen Expedition Reports are listed, with citations, in Table 1. Most attention was given during this visit to the insects, and Table 2 lists the determinations on insects, by orders and families, in the Expedition Reports. Collections made in some groups, such as the corals, remain unpublished; other groups were neglected. Thus it is difficult to gain an impression of the ecology of Farquhar from the work of the Percy Sladen team.

Apart from a visit in 1937 by Vesey-FitzGerald, who reported on the birds (1940, 1941), little further work was done on Farquhar until

Fig. 2. Farquhar Atoll. Data reproduced from BA Chart No. 718 with the sanction of the Controller, HM Stationery Office and of the Hydrographer of the Navy.



the 1960s. The atoll was visited in 1960 by the geologist B. H. Baker and the agronomist C. J. Piggott, and though no collections were made several useful accounts were published (Baker 1963, 80-85; Piggott 1968, 56-57; Piggott, unpublished, 48-53). In 1967 M.F.R.V. Manihine called at Farquhar with a party collecting for the National Museum, Nairobi, and including I. S. C. Parker, D. Wood and M. D. Gwynne; birds and plants were collected (Gwynne and Wood 1969, Parker 1970). On 19 September 1968 Manihine revisited Farquhar with a Royal Society party comprising T. S. Westoll, M. E. D. Poore and D. R. Stoddart. Stoddart and Poore traversed North Island, Iles Manahas, and the northern half of South Island, and visited Goelette; plants were collected and observations made on birds. In spite of the brevity of these visits, and of the others listed in Table 1, it is possible to give some account of the ecology of the atoll, and to indicate areas in which more detailed work is required.

Table 1. Scientific Studies at Farquhar Atoll

<u>Date</u>	<u>Study</u>	<u>Reference</u>
1504	Discovered by João de Nova; named after him.	
1776	Charted by M. Margaro	Adm.Ch.718(1878)
1821 May	Lieut. Hay, schooner <u>Eliza</u>	
1822 March 12	Lieut. Hay, <u>Wizard</u> and <u>Menai</u>	Moresby (1842)
1822 July 26	Visit by Fairfax Moresby, bird notes	Stoddart and Benson (1969)
1824	Chart additions by W. F. W. Owen; renamed after Sir R. Farquhar, Governor of Mauritius	Adm.Ch.718(1878)
1831	Further charting by Lt Hay	
1867	French chart by M. Lieutard	<u>Ann.hydrograph.</u> (1868, 32)
1878	Hydrographic chart by W. J. L. Wharton	Adm.Ch.718(1879)
1905 Sept. 28- Oct. 2	Percy Sladen Expedition: J. S. Gardiner, C. F. Cooper, T. B. Fletcher	Gardiner and Cooper (1907), Gardiner (1936)
1937	L. D. E. F. Vesey-FitzGerald, bird studies, economic insects	Vesey-FitzGerald (1940, 1941)
1956	W. Travis, underwater and general observations	Travis (1959)
1957 Dec. 7	W. D. Hartman, land birds	Hartman (1958)
1960 Sept. 26- 29	B. H. Baker (geology) and C. J. Piggott (soils)	Baker (1963) Piggott (1961, 1968)
1961 Sept. 28- Oct. 3	P. O. Wiehe, plants	Fosberg and Renvoize, this issue
1967 Oct. 3	M. D. Gwynne, D. Wood, I. S. C. Parker, collections of plants and birds	Parker (1970); Gwynne and Wood (1969)
1968 Sept. 19	D. R. Stoddart, M. E. D. Poore, T. S. Westoll, collection of plants, observations of geomorphology and birds	This report

Geomorphology

Lagoon and reefs

Knowledge of the reefs and submarine topography comes entirely from hydrographic surveys and aerial photographs (Figure 2), but it is clear that Farquhar lagoon is one of the most complex in topography and presumably in geomorphic history in the world. Three main divisions may be noted: (1) the main lagoon basin, 17 km long and with a greatest width of 7.5 km; (2) a triangular area on the south side, extending 4.5 km southwards from the rim of the main lagoon basin; and (3) a submerged spur at the northwest corner, extending for 7 km northwestwards with depths of 11-30 m.

The main lagoon basin is crossed by a series of narrow continuous ridges, up to 5 km long, trending approximately NE-SW. Air photographs suggest that these are not active reefs at the present time. These ridges divide the basin into three parts: a western part with apparently smooth floor at depths of 10-15 m, with hardly any reef knolls; a central part with very numerous knolls and patches, and depths probably about 8-10 m; and an eastern part with ridges and few knolls, and depths of 4-11 m. The southern triangular extension is crowded with knolls and patches, with deep holes of up to 16.5 m. The southern reef flat here is wide, with much coral growth around broad shallow entrances. Nothing is known of the northwest extension apart from the bathymetry shown in Figure 2.

The asymmetry of the shallow features of the atoll is thus marked; it is emphasised further by the character of the peripheral reef. The eastern reef flat is rocky, straight, and tidally emergent; it is largely covered with detrital islands. The reef on the south side is apparently actively growing, and its flat is low enough for coral growth. The reef flat on the west and north sides is poorly defined, with only small patches rising to intertidal levels. Air photographs show that the peripheral reef flats, both of the main basin and of the southern triangle, truncate structures within the lagoon. Thus lagoonal ridges near Goelette and South Island pass into reef flat deposits, and in the southern triangle debris sheets from the reef front are burying reef knolls in the back reef area.

There is only one entrance to the lagoon, a narrow channel 6-10 m deep near the north point, though much water must enter the lagoon over the windward reef flat south of Goelette and leave over the leeward reefs.

Bottom topography seaward of the peripheral reefs is also unusual. On the eastern side depths of less than 30 m are found between 1 and 2.5 km from the reef edge, though the floor then falls more steeply to depths of hundreds of metres. Along the north coast the zone less than 30 m deep is 1 km or less wide, though broadening at the northwest point.

These features are impossible to interpret without field investigation, but they probably result from a complex history, possibly involving differential movement or tilting of the atoll itself. The central oval lagoon is probably an old feature, though its linear ridges are uncommon in atoll lagoons elsewhere. The straight windward reef appears to be retreating lagoonward, truncating lagoon features and leaving a shelf at 20-30 m to seaward. It is possible that the southern triangular reef area is a recent addition to the atoll, perhaps formed by reef growth on a former submarine spur similar to that now extending to the northwest. The sharp distinction in the main lagoon between ridges, apparently largely reefless, and the adjacent deeper floor may result from karst erosion of old reef ridges during Pleistocene low sea level stands.

There is no information on the modern reefs. Gardiner (1936, 432-433) noted the absence of a boulder zone and fissured (algal) zone on the eastern reef flat, which he correctly stated was a rock flat with few corals. He described Heliopora and Porites in the lagoon, together with much Cymodocea. Living reefs are certainly damaged by frequent tropical cyclones, and some effects are described by Travis (1959, 69-73).

Islands

The eastern reef flat has a width of 1-1.5 km, and the islands standing on it are of simple form and structure. South Island, the largest, is 5.7 km long, 0.6-0.9 km wide, and has an area of 3.9 sq km. The crescentic North Island measures 8.5 km in length along its axis, is 0.2-1 km wide, and has an area of 3.2 sq km. Most of South Island is formed of dunes, both active coastal dunes up to 20 m high (Plate 1), and older inland dunes forming a hummocky surface. The lagoon shore of South Island is formed by a wide sand ridge, in places enclosing infrequently-flooded unvegetated areas (Plate 2), floored with poorly-sorted sands and gravels, which resemble the barachois of the Chagos atolls. On North Island the dunes are lower, and are found in the centre and on the lagoon side of the island as well as on the seaward side. Beaches are generally sandy, with local beachrock on the lagoon side up to 1 m above low water level (Plate 3). Seaward beaches on North Island are eroding (Plate 4), with resulting truncation of vegetation zones: dune faces are also eroding both on North Island and at the north end of South Island. Lagoon beaches by contrast are prograding (Plate 5). The only cobble beach seen was on the north side of South Island, facing the channel between it and the Manahas. Gravel is found in places on the island surfaces and on the floors of the South Island barachois, but is not common.

The three small Manahas islands are of considerable physiographic interest. Each is a cay of sand and gravel, resting on a platform of cemented cay deposits which extends up to 200 m seaward of the islet (Plate 6). The platform outcrops along the sides of channels between the islets, where it has a width of only a few metres, and

resembles outcrops of clastic rocks on the sides of similar channels (hoa) in the Tuamotu atolls. Such a conglomerate platform, which is quite distinct from the intertidal reef platform, was not seen on the main islands, except patchily on the lagoon shore of North Island, but may be forming beneath them as a cay sandstone. The surface of the Manahas conglomerate stands about 0.5 m above high water level, and is fretted by subaerial erosion.

Goelette is a small flat featureless island with seaward beaches of imbricate cobbles; it consists of sand and gravels, partly phosphatised (Baker 1963, 85). It has no beachrock. There are several small islets on the northern reef, but they have not been visited.

Gardiner (1936, 432) claimed to find "evidence in isolated masses of rock on the outer sides of the encircling reef, and especially on the islets, of an almost continuous or quite continuous reef that stood up for 10 feet or more above the water level, and formerly surrounded the whole bank, apparently about covering the existing reef". If these features exist they may be storm-cast reef-blocks: no trace of them was seen in 1968, though elevated reef-rock would be expected if the history of the atoll has been as complex as the lagoon bathymetry suggests.

Piggott (1968) distinguishes four soil series on the Farquhar islands: (1) the Farquhar Series, developed on fine dune sands; (2) Shioya Series, on non-dune calcareous sands; (3) small areas of phosphatic hardpan soil described as Jemo Series, though differing in some respects from the type Jemo Series described by Fosberg (1954); and (4) a small area of Saline Marsh on South Island. The parent materials of the Farquhar Series are relatively homogeneous, finer and more angular than those of Shioya Series, and Farquhar Series soils are generally developed on rolling topography with a deep water table. Parent materials of Shioya Series range from sands to gravels. Baker (1963) has given analyses of guano and phosphatic rock from Piggott's Jemo Series.

Tropical cyclones are common on Farquhar, and major storms occurred in 1893, 1926, 1950 and 1954. Apart from their effects on reefs, these storms have led to beach erosion, cutting back of dunes, and the mantling of island surfaces with coarse deposits.

Vegetation

Though plants were collected on Farquhar by Fletcher during the Percy Sladen Expedition in 1905, no list was ever published. The following paper by Fosberg and Renvoize describes collections made by Gwynne and Wood in October 1967 and by Stoddart and Poore in September 1968. The latter collection totalled 62 species of flowering plants, one moss and one lichen, to which can be added ten species of flowering plants recorded as sight records only. Gwynne and Wood (1969) record 47 species, including 16 sight records.

Both flora and vegetation differ markedly from those of elevated limestone islands in the Aldabra group, and resemble more those of the sand cays of the Amirantes and the central Indian Ocean. No rainfall records have been kept, but with probably 1200 mm/yr Farquhar is considerably wetter than Aldabra and Assumption. Both the raised limestone community and the mangrove community are absent on Farquhar. The islands are simple sand cays with dunes, but the vegetation, though characteristic of such habitats, is complicated by a long history of human interference, with the result that there is a strong gradient in number of introduced species southwards from the settlement on the North Island. The channel between North and South Islands forms a major break in this gradient, and though both of the main islands are largely covered with coconuts, North Island has many more introduced species of herbs and grasses in the ground layer than has South. Nesting seabirds also influence the vegetation, particularly on the smaller islands. Farquhar is affected by a major cyclone about once in 25 years, when the littoral vegetation and also the trees, especially the coconuts, are subject to major damage.

Nine vegetation types can be distinguished on Farquhar on the basis of our brief reconnaissance in 1968:

- (1) Seaward beach without dunes: where the beach is stable there is a hedge of Scaevola, Tournefortia, Pemphis and Suriana; where the beach is retreating, inland species such as Casuarina are found at the beach crest.
- (2) Seaward coastal dunes: these are covered with a mosaic of Suriana, Scaevola and Tournefortia, with Fimbristylis and Portulaca.
- (3) Inland stable dunes: mainly under coconuts and Casuarina, with a ground cover of grasses (Plates 7, 8 and 9).
- (4) Inland sand or fine gravel areas, under coconuts or Casuarina, with considerable diversity in ground cover (Plate 10).
- (5) Lagoon beach, mainly edged by Scaevola, Suriana and Pemphis.
- (6) Barachois, edged by Pemphis and Suriana, with a sparse irregular cover of grasses and sedges.
- (7) Inland depressions with standing water or wet ground. These are uncommon; one on North Island has a solitary Rhizophora.
- (8) Herb mat community dominated by Boerhavia and Achyranthes, found in the tern-nesting area on Goelette Island.
- (9) Vegetation in the main settlement and also adjacent to individual houses elsewhere, dominated by introduced decorative and cultivated plants.

North Island

The vegetation of North Island has been much affected by recent cyclones: the seaward beach has eroded, and many coconuts and Casuarina trees have been broken inland. The main vegetation type is coconut woodland in the flatter inland areas. Apart from Casuarina and, especially in the north, wild Carica papaya (Plate 11), few other trees

are present, and those which are found are concentrated near the lagoon shore beach hedge. They include Cordia subcordata, a Ficus, and Hernandia sonora, none of them common; Guettarda speciosa and Thespesia populnea were not seen. According to Piggott (1968, 36) wild Carica is an indicator of phosphatic soils, and groves of this species were growing wild on North Island as early as 1905 (Gardiner and Cooper 1907, 144).

The sward beneath the coconuts is extremely variable, more especially in the north where it is clearly frequently cut. In addition to grasses (Cenchrus echinatus, Digitaria horizontalis, Stenotaphrum dimidiatum, Dactyloctenium aegyptium, Chloris barbata) and sedges (Fimbristylis cymosa, Cyperus dubius, Cyperus ligularis), and the vine Cassytha, there are more than twenty species of flowering plants present. Those collected include:

<u>Achyranthes aspera</u>	<u>Parthenium hysterophorus</u>
<u>Bidens pilosa</u>	<u>Passiflora suberosa</u>
<u>Boerhavia diffusa</u>	<u>Phyllanthus amarus</u>
<u>Euphorbia hirta</u>	<u>Phyllanthus maderaspatensis</u>
<u>Euphorbia prostrata</u>	<u>Portulaca oleracea</u>
<u>Gynandropsis gynandra</u>	<u>Sida cf. parvifolia</u>
<u>Ipomoea tuba</u>	<u>Stachytarpheta jamaicensis</u>
<u>Kalanchoe pinnata</u>	<u>Striga asiatica</u>
<u>Laportea aestuans</u>	<u>Tribulus cistoides</u>
<u>Launaea intybacea</u>	<u>Turnera ulmifolia</u>
<u>Lippia nodiflora</u>	<u>Vernonia cinerea</u>

Turnera is particularly conspicuous in many places, but often there is a very diverse assemblage with no single dominant. The fern Nephrolepis biserrata is present and locally abundant on the ground.

The coconuts are generally 10-12 m tall. In the middle of the island many are snapped off and crownless (Plate 8). Newly planted coconuts towards the southern end are 2-3 m tall. Mature Casuarina trees throughout the island reach 20 m in height.

The seaward beach on North Island is sandy and retreating (Plate 4). Broken, sometimes dead, juvenile Casuarina line much of the beach crest, with a zone of spindly Scaevola taccada to landward. Pemphis is also found on the seaward beach. The ground under the shrubs is often bare, but Triumfetta procumbens was collected on the beach itself. The lagoon shore is prograding, with a dense hedge of Scaevola taccada and Suriana maritima, and occasional trees of Casuarina and Cordia.

Dunes carry a distinctive vegetation. On active dunes, as at the southern tip of the island, there is a shrub layer of bushy Scaevola taccada 1.5 m high, with a largely bare ground surface dotted with rosettes of Fimbristylis cymosa and Eragrostis: the ground here is being eroded by wind and the sedges and grasses stand on small

pinnacles. Non-active dunes are common over the island and carry mature Casuarina woodland with a mixed ground vegetation.

One small marshy area in the centre of the island contains a solitary tall Rhizophora, the only mangrove seen on Farquhar, with a dense ground cover of Stenotaphrum.

The main settlement at the north end of North Island contains several trees not seen elsewhere, in addition to tall Casuarina and Hernandia sonora. These include Ochrosia oppositifolia, Moringa oleifera, Terminalia catappa, Calophyllum inophyllum, and Tabebuia pallida, the last a New World decorative. Cultivated plants of economic value include Gossypium hirsutum, Agave, Musa, Ricinus communis, various cucurbits, and maize; decoratives include a red-flowered Opuntia, Catharanthus roseus, Bidens sulphurea, Heliotropium indicum, Solanum cf. melongena, Malvastrum coromandelianum, Gaillardia lanceolata and Zinnia elegans. The whole area of the settlement has the appearance of long-continued human occupation and alteration.

Manaha Islands

These three small islets between North and South Islands are covered with a tall woodland of Cocos and Casuarina. Each has a littoral hedge of Tournefortia argentea, Scaevola taccada and Suriana maritima. The ground vegetation beneath the coconuts consists of abundant vines of Ipomoea tuba, clumps of Fimbristylis cymosa, and little else. The contrast with the diversity of similar ground vegetation on North Island is very striking.

South Island

Like North Island, South Island has a small settlement, not permanently occupied, at its northern end; a large part of the island is covered with dunes; and most of the rest by coconut or Casuarina woodland. In the coconut woodland few other trees are present (rare Hernandia sonora and Cordia subcordata) and there are few shrubs. The ground cover is similar to that under coconuts on North Island, but fewer species are present. Grasses include Eragrostis sp., Cenchrus echinatus, and Dactyloctenium aegyptium; the sedges Fimbristylis cymosa and Cyperus ligularis. Other flowering plants noted in the ground layer include:

<u>Achyranthes aspera</u>	<u>Phyllanthus amarus</u>
<u>Boerhavia diffusa</u>	<u>Portulaca cf. australis</u>
<u>Cassytha filiformis</u>	<u>Sida</u> sp.
<u>Euphorbia prostrata</u>	<u>Striga asiatica</u>
<u>Ipomoea tuba</u>	<u>Turnera ulmifolia</u>
<u>Kalanchoe pinnata</u>	<u>Vernonia cinerea</u>
<u>Malvastrum coromandelianum</u>	

A single bryophyte, collected on the surface of old dunes in heavy shade, can only be determined as Bryum sp. or Pohlia sp. by C. C. Townsend.

The seaward dunes are covered with a dense growth of Scaevola taccada, with Suriana maritima and some Tournefortia argentea. The lagoon beach is lined mainly with Scaevola and Suriana, and the long inlets or barachois by Suriana and Pemphis acidula. The lichen Usnea was collected from Suriana on the margins of one of the barachois.

The small settlement has introduced trees, particularly Moringa oleifera but also including a single young Barringtonia asiatica. Musa sp., Ricinus communis and Amaranthus dubius are cultivated, and the decoratives include Mirabilis jalapa and Gaillardia lanceolata.

Goelette Island

The tern-breeding island of Goelette is almost devoid of trees (one Cocos and one Casuarina, both small and sickly) and shrubs (some low Suriana maritima and Tournefortia argentea on the northwest shore). Almost the whole island is covered with a low mat of Ipomoea pes-caprae vines, the sedges Fimbristylis cymosa and Cyperus ligularis, and especially Boerhavia diffusa and Achyranthes aspera, the latter forming the tallest vegetation apart from the rare trees and shrubs. No species not present elsewhere on the atoll were found on Goelette, but the absence of Stachytarpheta jamaicensis, dominant in similar bird colonies on Desnoeuvs, Amirantes (Ridley and Percy 1955), and present on North Island, may be noted.

Fauna other than Birds

Both the land and marine fauna of Farquhar are very inadequately known, for apart from Gardiner's party in 1905 no attention has been paid to any group except the birds. Gardiner's own collections were small by comparison with those he made on other islands during the Percy Sladen Expedition. A single marine alga is recorded (Gepp and Gepp 1909), but the collections of marine fauna, other than pelagic forms, are very small (Table 2). Gardiner and Cooper (1907, 144-145) described the Green Turtle nesting on Farquhar, and it still does so.

According to Rothschild (1915) the Giant Land Tortoise Geochelone gigantea formerly existed on Farquhar but has become extinct. No evidence for this statement is known, either historically or in the fossil record. However, two Giant Tortoises from Aldabra are present on North Island: one of these was seen in 1968, in the coconut woodland near the south end of the island, and is considerably larger than any tortoise now living on Aldabra, presumably in response to the wetter climate, richer vegetation, and absence of competition. Boulenger (1909) recorded two reptiles, a Hemidactylus and a Phelsuma, but neither was seen in 1968. Two crabs (Cardisoma, Coenobita) are

Table 2. Marine Fauna recorded from Farquhar Atoll

<u>Group</u>		<u>Number of species</u>	<u>Reference</u>	
Coelenterata	Hydroids	4	Jarvis (1922)	
	Siphonophorae	19	Browne (1926)	
	Medusae	8	Browne (1916)	
	Alcyonaria	1	Thomson and Mackinnon (1910)	
Annelida	Polychaeta	1	Potts (1910)	
Echinodermata		3	Bell (1909)	
Crustacea	Decapoda	Anomura	1	Laurie (1926), Borradaile (1907)
		Brachyura	1	Borradaile (1907), Rathbun (1911)
Mollusca	Stomatopoda	5	Tattersall (1912)	
	Gastropoda	4	Melvill (1909)	
	Pteropoda	8	Tesch (1910)	
	Heteropoda	4	Tesch (1910)	

recorded by Borradaile (1907), and nine species of Arachnida (Neumann 1907, Hirst 1911). There are no native mammals. Bainbrigge Fletcher collected insects in 1905, and this accounts for the 66 species of insects recorded in the Percy Sladen Reports: citations of Farquhar material in these Reports are keyed in Table 3.

Table 3. Insects recorded from Farquhar Atoll
by the Percy Sladen Expedition

<u>Group</u>	<u>Number of Species</u>	<u>Reference</u>
Apterygota	1	Carpenter (1916)
Orthoptera	9	Bolivar (1912, 1924)
Dermaptera	2	Burr (1910)
Hemiptera	7	Distant (1909, 1913), Green (1907)
Neuroptera	1	Needham (1913)
Lepidoptera	16	Fletcher (1910), Fryer (1912), Meyrick (1911)
Coleoptera	18	Arrow (1922), Champion (1914), Fleutiaux (1923), Gebien (1922), Grouvelle (1913), Scott (1912)
Hymenoptera	11	Cameron (1907), Cockerell (1912), Forel (1907), Meade-Waldo (1912)
Diptera	1	Lamb (1922)

It is clear from this record that little can be said about the invertebrate fauna of Farquhar, either marine or terrestrial, without further collecting.

Birds

Breeding land birds

The number of land birds is very small by comparison with that on the elevated limestone islands, and all four species recorded may have followed human settlement. Apart from a possible Alectroenas, now extinct (Stoddart and Benson 1970), and a dubious sighting of "a solitary and shy warbler which I could not identify" by Travis (1959, 66), the native land bird fauna of Farquhar may have been nil. The following species are recorded.

Foudia madagascariensis

Native according to Gardiner, introduced according to Hartman (1958). Common everywhere, especially on North Island in 1968.

Streptopelia picturata

Recorded (as Turtur picturatus) as "very common in Farquhar", probably introduced from Madagascar, by Gadow and Gardiner (1907, 107). No other record known; not seen in 1968.

Geopelia striata

Introduced before 1905 and then common around North Island settlement (Gardiner and Cooper 1907, 144). ♂ collected on North Island by Parker, 3 October 1967. Common, especially on the northern half of North Island, 1968.

Bubulcus ibis

♀ collected on Goelette by Parker, 3 October 1967. Breeding in Suriana bushes on Goelette, September 1968; six adult birds.

Possibly resident shore birds

Ardea cinerea

Sight, Manahas, September 1968.

Butorides striatus

Sight, North Island, September 1968.

Migrants

Arenaria interpres

Sight, Manahas, September 1968.

Squatarola squatarola

As S. helvetica in Gadow and Gardiner (1907), 1 specimen.

Charadrius alexandrinus

Sight record, as Aegialitis cantiana, in Gadow and Gardiner (1907).

Limosa lapponica

1 specimen taken, 1905 (Gadow and Gardiner 1907).

Crocethia alba

Sight, Manahas, September 1968.

Erolia testacea

♀ collected by Parker, Goelette, 3 October 1967.

Dromas ardeola

Sight, Manahas, September 1968.

Other species are recorded from Providence Bank by Watson and others (1963, 187). Charadrius leschenaultii and Numenius phaeopus in particular are likely to occur.

Sea birds

The main sea bird breeding ground is on Goelette Island (Plates 14, 15 and 16), and has been exploited in the past for terns' eggs (Ridley and Percy 1955). Vesey-FitzGerald (1941, 525) recorded that "about 25,000 birds [Sterna fuscata] were reared in 1937 after heavy egg-collecting" on this island; he also recorded Sterna sumatrana and roosting Anous tenuirostris. Travis (1959, 62-63) found few if any Sooty Terns on Goelette, the whole being covered with Noddies, but the time of year of his visit is not clear. Parker in October 1967 collected four species of terns (Sterna albifrons, S. fuscata, S. sumatrana, S. dougalli) on Goelette, and saw Thalasseus bergii. He found several thousand young Sooty Terns on the island, all more than half fledged and the majority fully fledged, and he noted a large number of dead or dying birds (Parker 1970). A large number of Noddies Anous stolidus also nest on Goelette, but were already fledged at the time of Parker's visit. In September 1968 we found many thousands both of Sterna fuscata and Anous stolidus on Goelette, in large discrete flocks. Again most of the terns were fledged, and there were large numbers of dead birds. The whole island was covered with ticks (Amblyomma sp.?), in contrast to similar bird colonies on African Banks.

The only other sea bird definitely known to nest on Farquhar is the Red-footed Booby Sula sula. Travis (1959, 64-65) records nesting boobies with chicks in Casuarina on the east side of South Island. This colony was seen, in tall Casuarina stained white by the birds, on the lagoon shore of South Island in 1968. Other sea birds may nest on the small remote sand cays of the northern reef, but these have not been investigated.

The following sea birds have been recorded from Farquhar:

Sula dactylatra

Recorded by Vesey-FitzGerald (1941) from Goelette.

Sula sula

Recorded from South Island by Vesey-FitzGerald (1941) and Travis (1959), and seen in 1968. Breeds in Casuarina.

Fregata minor

Sight, September 1968; not common.

Sterna dougallii

♀ collected by Parker on Goelette, 3 October 1967.

Sterna sumatrana

Recorded by Vesey-FitzGerald (1941) on Goelette; ♂ collected by Parker on Goelette, 3 October 1967.

Sterna fuscata

Breeds in thousands on Goelette. Recorded by Vesey-FitzGerald (1941) and later visitors. ♂♀ collected by Parker on Goelette, 3 October 1967.

Sterna albifrons

♀♀♂♂ collected by Parker on Goelette, 3 October 1967.

Anous stolidus

Recorded by Parker on Goelette; present in thousands in September 1968.

Anous tenuirostris

Recorded as roosting on Goelette by Vesey-FitzGerald (1941).

Gygis alba

Recorded by Stoddart and Poore, September 1968: probably the "small white gull" noted by Moresby in 1821-2 (Stoddart and Benson 1969).

Settlement

Farquhar was discovered by Joao de Nova in 1504, but apart from the French hydrographic survey in 1776 and the British in 1824, nothing is known of its history until the early nineteenth century. The atoll was apparently uninhabited when a ship named the St Abbs was wrecked there in 1855, though Lieut. Hay had found a fishing settlement established on 12 March 1822 (Moresby 1842, 680). A small fishing station was established soon afterwards (Lieutard 1868), and planting of coconuts followed: a considerable number were planted on North Island by a Mauritian firm in 1870 (Findlay 1882, 546-547). According to a visiting Stipendiary Magistrate (reported in Bergne 1900), however, coconut trees were not bearing by 1879. At this time the population numbered 40 men, with an export of salt fish and turtle valued at Rs 14,000. More coconuts were planted by James Spurs about 1885 (Gardiner and Cooper 1907, 143), but many were destroyed in the

cyclone of 1893. In 1895 the coconuts which survived were in full bearing, producing about 70,000 nuts per month, and supporting a population of 100 men, women and children (Bergne 1900). Planting began on South Island as late as 1905 (Gardiner and Cooper 1907, 143).

Piggott (1961, 82) has summarised the history of the coconut plantations. By 1950 they were yielding 30 tons of copra per month. 30,000 trees were destroyed, however, in the major cyclone of that year. In spite of replanting, copra production in 1960 was only 20 tons per month, and 24 tons in 1967.

The settlement (Plate 17) in 1968 consisted of 39 people, all resident on North Island, with 31 head of cattle, 2 donkeys, and 2 horses, pigs, chickens, turkeys, ducks, geese and bees. Maize has been cultivated at least since 1905. The economic development of the atoll is limited both by the recurrent cyclones and by the great distance to Mahé, in both respects comparing unfavourably with competing plantations in the Amirantes and on Coetivy.

From 1814, when Mauritius came under British rule, Farquhar was administered as part of the Colony of Mauritius, and while the new Colony of Seychelles was formed in 1903, Farquhar was not transferred to it until December 1921. In 1965 Farquhar was detached from the Seychelles and became part of the British Indian Ocean Territory. As such it is covered by the provisions of an agreement between Britain and the United States governing the use of B.I.O.T. for defence purposes for a period of not less than fifty years.

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